



Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 2002		2. REPORT TYPE		3. DATES COVERED 00-00-2002 to 00-00-2002	
4. TITLE AND SUBTITLE Scientific Warriors. Do They Have a Place in the 21st Century Army?				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Asst Secretary of the Army for Acquisition, Logistics & Technology, Pentagon, Washington, DC, 20330				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES Acquisition Review Quarterly, Fall 2002					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 14	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

SCIENTIFIC WARRIORS

DO THEY HAVE A PLACE IN THE 21ST CENTURY ARMY?

LTC Camille Nichols, USA

The Army has studied the requirement for uniformed Army scientists (UAS) numerous times over the past 20 years concluding every time that the Army must have a complement of highly educated technical officers. So far, such a program has failed to win the necessary support for implementation. Why doesn't it happen? This paper looks at the viability of instituting a uniformed scientist program in the Army today. The paper attempts to explain why the Army has failed to implement a UAS program; reaffirms the Army's need for scientific warriors; provides an update on current support for an UAS program; recommends institutionalizing a scientist program, and suggests several implementing actions.

This is an exciting time to be a soldier. The U.S. Army is ready to jettison its Cold War image and is about to burst into the high threat arena with lighter, faster, information based, high-tech equipment, and a sense of renewed importance and combat preeminence. The Objective Force Warrior and the Future Combat Systems are not your great-grandfather's Doughboy and Springfield rifle. These two constructs for the Army of the future are heavily dependent on emerging technologies. Technology has always had an influence on warfare, but today the rate of change is faster than at any time in history. The Army is a technologically inten-

sive enterprise that depends on the advantage of technology on the battlefield for mission success. The Army maintains an active role in research and technology development to sustain that technology edge. Keeping the technical community properly focused is one critical aspect to the success of the process; the other critical aspect is ensuring today's leaders understand the benefits to the warrior of current and emerging technologies.

Army civilians and contactors largely carry out technology generation. However, their interface and credibility with the military customer is a chronic problem. The community recognizes a need for

"West Point was founded in 1802, the first engineering university in America, to provide the Army with highly technical, skilled leaders."

technically educated military officers to participate in and provide a military perspective to do research and technology development, as well as, advise military leaders on the impact technology can have

on war fighting. The Army has studied the requirement for uniformed Army scientists (UAS) numerous times over the past 20 years concluding every time that the Army must have a complement of highly educated technical officers. So far, such a program has failed to win

the necessary support for implementation. The Army can succeed in providing for the national defense without these highly educated officers. However, it will be more effective as a knowledge-based organization leveraging technology into every aspect of warfare with the assistance of its scholar soldiers.

HISTORICAL REVIEW OF UNIFORMED SCIENTIST PROGRAMS

Soldier scientists and engineers have been part of the Army for over 200 years. West Point was founded in 1802, the first engineering university in America, to provide the Army with highly technical, skilled leaders. Military scholars have assisted in some of the most incredible technological advances in modern history — the Panama Canal, radar bombing, ship-launched bomber aircraft, nuclear weapons, the computer, and cipher work by military mathematician cryptologists. The Army has sent thousands of officers to

receive their doctorates only to have almost all of these officers leave the Army soon after their degree completion. The personnel system selects branch qualified, high performing officers to send to doctoral programs — officers with proven track records.

Most of the research conducted by the Army Science Board reveals that it is not poor job performance that causes these scientific officers to leave the Army (J. Johnson, personal communications, February 1, 2002). The Army forces out the scholar soldiers because of the apparent lack of recognition of their contribution (passed-over for promotion) to the Army, or they depart frustrated over the Army's poor management of their careers and underutilization of their knowledge. There are several mechanisms to bring in these technically degreed officers, but seemingly no adequate system to keep them in the Army. They get in, but they do not stay.

The Army conducted four major studies on the UAS concept between 1981–2001 in an attempt to determine if the Army needs uniformed scientists and why the military scientists do not stay in the Army. The following analysis reviews these studies synthesizing the findings and the recommendations of each.

ARMY SCIENCE BOARD 1982 SUMMER STUDY

The Army Science Board's (ASB) study focus was the potential shortage and inability to retain scientists and engineers (uniformed and civilian) in the Army's research, development, and acquisition (RD&A) field in a time when even greater requirements for highly trained technical personnel were emerging. The study has numerous recommendations that span four

main areas: (1) Army military RD&A management; (2) Army civilian science & engineering (S&E) resources; (3) university and industry resources; and (4) national technology literacy. The main findings for this treatise are in the area of RD&A management: the Army needs more officers trained in S&E especially in the RD&A career field and the requirements generation process; and the officers in the S&E field do not have sufficient career opportunity in the Army. Recommendations include: increase ROTC programs to access more officers with S&E degrees; establish a new career plan for RD&A officers that has the officer serving in mostly RD&A jobs with some operational assignments; and an opportunity for promotion equitable with the combat officers. This study reaffirms the need for uniformed scientists and engineers in the Army to improve the management of RD&A and handle the increasing complexity of war fighting and weapon systems.

U.S. ARMY LABORATORY COMMAND

The U.S. Army Laboratory Command (1990) initiated review of the UAS program because of the inability to retain uniformed scientists in the Army laboratory system. Labs were unable to fill position vacancies and unable to assist in promotion of most of the uniformed scientists that served in labs. The review laid out the many benefits to the Army from a properly implemented UAS program. These benefits included: a soldier-civilian link and a link between technology and the battlefield; improvement in the acquisition process; increased confidence from Congress and the public; and better retention of the soldier scientists. The review

reaffirmed most of the ASB's 1982 Summer Study findings related to the need for military scientists and a formalized career field for them with adequate promotion opportunities.

U.S. ARMY MATERIEL COMMAND DECISION BRIEF

The U.S. Army Materiel Command's (AMC; 1991) briefing encapsulates the suggestions of the April 1988 Leader Development Action Plan and the recommendations of the November 1989 Uniformed Army Scientist Working Group. The briefing restates the need to have military officers with technical doctorate degrees to work in the Army labs and assist in RD&A of military weapons. The briefing establishes a requirement for 250 officers to serve from Second Lieutenant through Colonel in various RD&A locations in the Army. The briefing suggests that the program start with Ph.D.s already in the Army within AMC and the U.S. Military Academy (USMA), and the Army specially manages this new career field by establishing promotion floors.

"The U.S. Army Laboratory Command (1990) initiated review of the UAS program because of the inability to retain uniformed scientists in the Army laboratory system."

ARMY SCIENCE BOARD 1995

The Army Science Board study began in February 1994 with the final report published in February 1996. Initially, the study's charter included military and civilian scientists and engineers in the Army. The study refocused on just the military scientists and engineers due to the breadth

of work and the disparate accession and management systems (J. Johnson, interview, February 1, 2002). The study's conclusion was somewhat controversial in its condemnation of the low state of technological proficiency within the officer corps — line officers have low-technology literacy, the Army uses low-tech training strategies, and the Combat Development organizations lack technological expertise.

With respect to the issue of UAS, the study concluded technical literacy is no longer highly valued by the Army as a line-officer skill and the institutional Army does not recognize the value of uniformed technologists. The study recommendations include: establishing a second career path, creating a promotion template and assignments for Army technology leaders;

identifying and filling green suit technologist positions in schools, battle labs, and the operational Army; placing more senior technologists on every 3- and 4-star staffs as a technology advisor; and raising the science and engineering education standards for all Army commissioning sources.

In spite of the Army's poor record of managing and appreciating the uniformed scientists, the study also found that every individual interviewed supported the need for green suit technologists.

Every study recommends institutionalizing a UAS program in order to maximize the value of uniformed scientists to the Army. The civilian community cannot provide the technical expertise the Army requires; the 1995 Army Science Board reaffirms this in its assessment of

how best to assimilate technology into today's Army — contractors and civilians cannot meet the increasing demand for technical expertise in transitioning technology into military capability (J. Johnson, interview, February 1, 2002).

INTRINSIC VALUE OF SCIENTIFIC WARRIORS

It is interesting to find the Army disregarding such a documented need — the benefit these officers provide to the Army must be either inconsequential or misunderstood. To understand the value of a scientific warrior or a uniformed scientist, some formal definitions are in order. A uniformed scientist is a commissioned officer with requisite military qualifications that fills designated RD&A positions requiring scientific and engineering qualification (U.S. Army Materiel Command [AMC], 1991). A scientific warrior is a deeply learned or scholarly soldier — a person of deep knowledge and wisdom who is also a soldier. I introduce the new term because it was obvious during my interviews and research that the term uniformed scientist elicited negative connotations. The negativity arose from concern over creating an elitist corps of officers (the UAS) that would be micro-managed and detract from the rest of the force. This is a striking contrast to the value scholarly scientists have in industry.

J.A. Miller, Dupont Company, in testimony before the Subcommittee on Basic Research stated, "These products (Ph.D.s) of graduate education are our most valuable contributors, trained and working at the forefront of technology and critical to the company's competitiveness in the global marketplace" (U.S. House of

"A scientific warrior is a deeply learned or scholarly soldier — a person of deep knowledge and wisdom who is also a soldier."

Representatives, 1995, p. 119). Other characteristics of learned scientists cited as rationale to seek Ph.D.s in other companies are: smart, intense, driven, problem solvers, entrepreneurs, quixotic, analytical, adaptable, and pragmatic (U.S. House of Representatives, 1995, p. 177).

General Shinseki testified in October 1999, "The S&T Community is key to the long term transformation of the Army" (Christle, 2001, p. 82). In the study on Army Acquisition Management, the General Accounting Office (GAO) states, "...reliance on immature technologies can be a major source of cost increases, schedule delays, and performance problems in

weapon systems. Technologies, therefore, should be transitioned with caution, only after sufficient, objective, technical evaluation" (Christle, 2001, p. 82). The GAO identified the need for greater oversight by technically skilled acquisition leaders in the Army.

The Center for Naval Analysis study asserts: requirements process and personnel involved as Training and Doctrine Command (TRADOC) System Managers must have more technical expertise to guide them in making trade-offs and setting more achievable goals (Christle, 2001). Philip Schofield (2000) expounds the value of doctorate-level scientists even further,

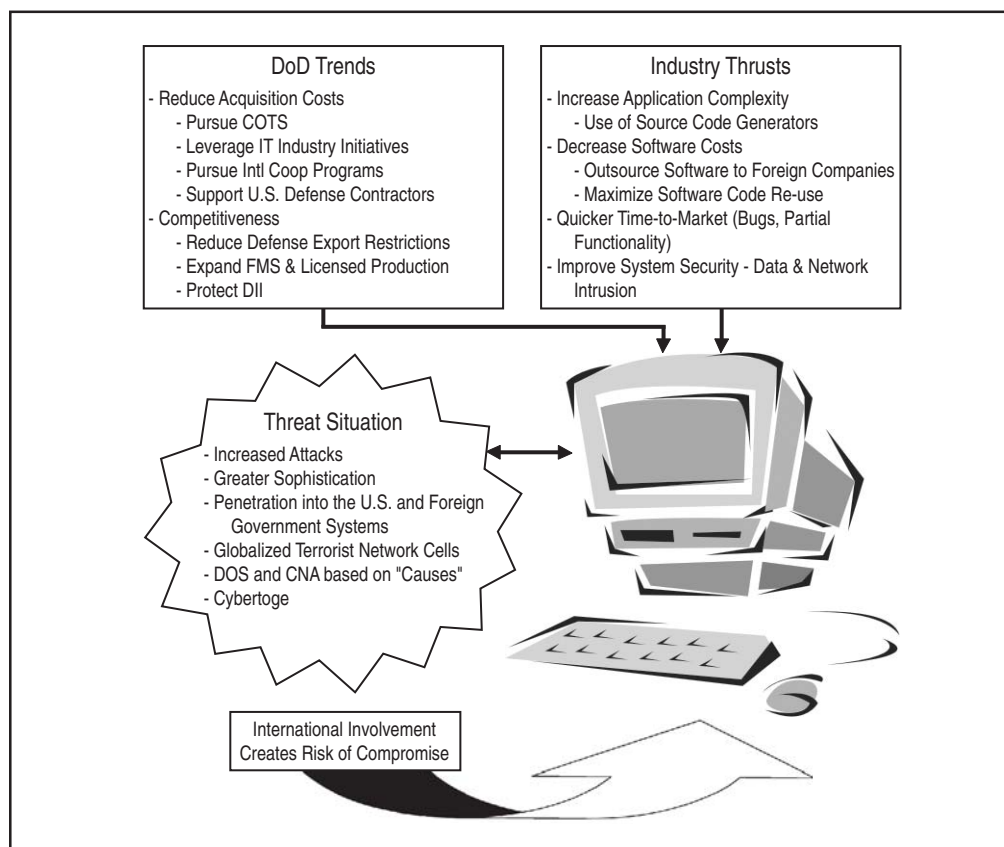


Figure 1. Software Security Risks

“...postgraduate research develops independent research skills in terms of identifying problems and knowledge gaps, and then developing methodologies to solve those problems. It helps people develop analytical and experimental skills which will allow them to do all sorts of their jobs better” (p. 1). These four perspectives highlight the need for scientific warriors. A list of some of the indubitable worth of these officers within the Army follows.

- Provide expert scientific knowledge and experience to Army leadership and policy makers.

- Assist in collaboration between labs and Army commands by rotating assignments from lab to “field,” etc.
- Assist in development of better-defined materiel specifications.
- Assist in evaluation of proposals, change orders, system upgrade options.
- Function as the lynchpin between the military needs and the technology opportunities the technology base proffers.
- Ensure the Army is using all of the country’s research resources.

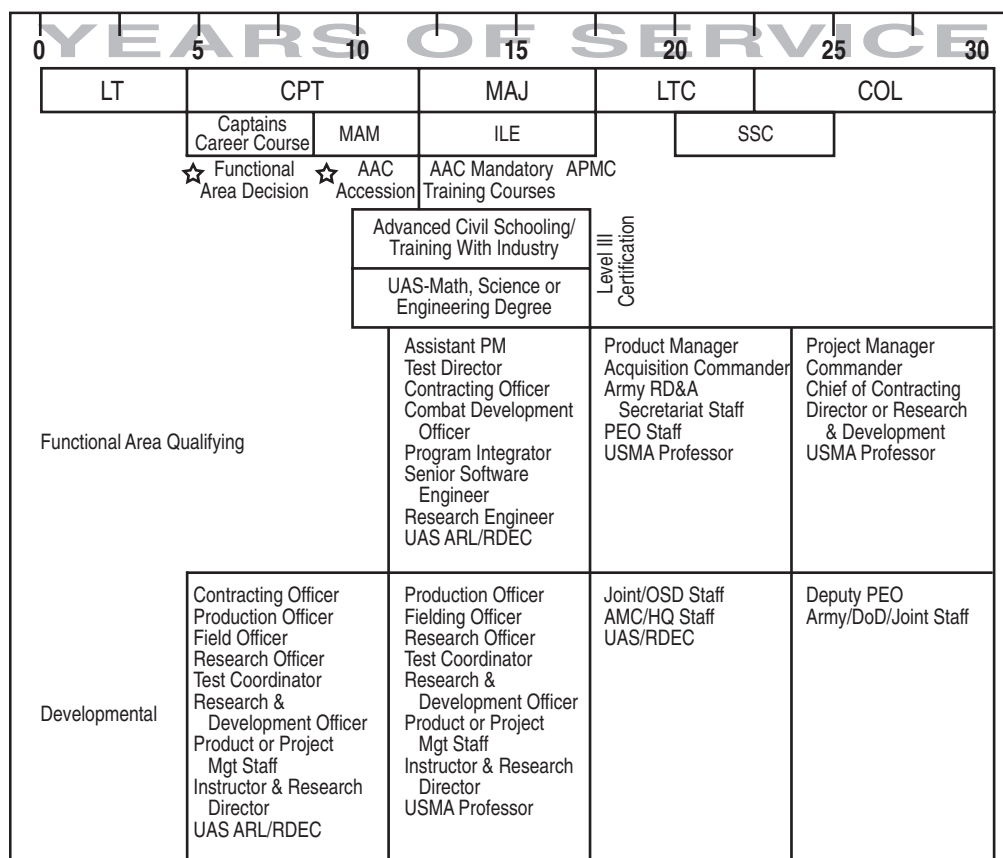


Figure 2. ACC Life Cycle Development Model

- Assist in application of the chosen technologies to meet battlefield requirements.

West Point is celebrating its 200th anniversary. As it does so, we remember that it was founded to provide a technical education to military officers to assist America in building a new nation. General McCaffrey (2002) discusses the need to renew this sense of providing this nation technically competent leaders, "The Army cannot defend America unless we educate a scientifically literate officer corps. These disciplines are difficult...we must train our military leaders to understand and exploit modern technology" (p. 12). The final analysis of the past efforts to create a UAS program and the intrinsic value of the scientific officers concludes not with the question "Can the Army afford to have a UAS program?" but with the assertion that it cannot afford *not to* implement the program as soon as possible.

UAS STATUS

The UAS program formally reemerged in 1998 because of the efforts of the AMC Deputy Chief of Staff for Research Development and Acquisition (DCSRDA) to increase the visibility of the issue. These efforts resulted in acknowledgement in the Officer Personnel Management System (OPMS) XXI study for the potential need for a uniformed scientist program and approval by the Chief of Staff of the Army (CSA) for the UAS to be one of the OPMS XXI implementation action items. The Army, under CSA Decision 7.0, designated AMC the Executive Agent for Army scientists with proponency remaining with

the Director of Acquisition Career Management. A working group within AMC studied the matter for over two years and recommended that the Army not develop a UAS career track. The Group found there was not enough support for the UAS program in the Army to establish, manage, and sustain a separate career track, or as a subspecialty within the Army Acquisition Corps career track. Therefore, in June 2000 the Deputy Chief of Staff, Personnel for the Army agreed to not establish a career field for uniformed scientists in the new officer personnel management system (Story, 2002).

Some ideas, especially the good ones, do not go away even when disapproved time after time. Since December 2000, the AMC Commanding General (CG) and the Military Deputy to the Army Acquisition Executive (then LTG Kern) have resurfaced the concept of establishing a uniformed scientist program within the Army Acquisition Corps (AAC) with positions provided mostly within AMC's research centers. The Vice CSA (VCSA) and the CSA support having green-suit scientists in the Army's labs and research centers. Currently, General Kern, the new AMC CG, is working with the Army Personnel Center to fund doctorate education for a new group of officers and develop positions and policy to properly manage the scientists upon degree completion (Story, E-mail, March 15, 2002).

The summation of Army's dilemma is that it has a documented, valid need for these scientific officers, yet has failed

"Most companies incorporate the changes necessary to gain competitive advantage and prosper in their industry."

several times to successfully institute a program. This failure is primarily due to two things: no institutionalized career program exists that utilizes their skills adequately and an Army culture that does not value scientific contribution above normal command and staff assignments (Johnson, interview, February 1, 2002). The Army does have scientific warriors currently in its ranks serving in varied positions (Thurgood, 2002). There are approximately 121 non-medical Army officers on active duty with technical doctorate degrees. It is important to note some of these officers received their advanced degrees without Army assistance. The Personnel Center has 53 validated doctorate positions in the Army; 34 of which are in AMC laboratories. The key question now, is how can the Army incorporate these crucial warriors into its institution to capitalize on their value.

RECOMMENDATION

Most companies incorporate the changes necessary to gain competitive advantage and prosper in their industry.

This includes acquiring the requisite technically skilled individuals and creating a climate for them to perform and thrive (contribute and advance). The Army is in the throes of a radical makeover in an era of technological expanse, and it must seek knowledgeable individuals in order for it to thrive. The Army has already made significant changes in how it manages officer personnel and in how the future force and transition forces will fight (doctrine and equipment). It is still missing a key ingredient to enhance the transformation process — the scientific warrior, the lynchpin to metamorphose the technology into fightable combat power. If the UAS program ever has a chance, it is right now. The Army is ready — the new personnel system and the exaltation of technology by the Army leadership set the stage and tone to make this program work!

So, how does the Army “...Imbue the value of technology in the ethos of the officer corps” (Johnson, 1996)? The Army can do this by embracing the technical warriors the same way it does its other warriors — create a professional structure that ensures proper assessment, management, development, utilization,

Recommendations

- Recognize Divergent Interests
- Recognize Vulnerability Created by Off-Shore Activities
- Evaluate Risk of Compromise in Cooperative Programs
- Focus Research Efforts on Software Security
- Establish Certification Program for Software Security

Figure 3. Recommendations

and promotion. The Army must embody the scientists and engineers, inducted with the same high regard as other very specialized officers (Foreign Area, Military Intelligence, Operations Research and Acquisition).

The proposed concept is the Scientist and Engineer Officer (SEO) program. I proffer a new moniker because of the possible lingering disdain for the previous attempts to create military scientists. Many an acquisition program was reborn successfully by merely changing its name; marketing is important here to gain leadership acceptance. The SEO program builds on the former UAS concept and incorporates many of the recommendations proposed by all four studies discussed herein. The remainder of this section highlights the key aspects of the SEO program.

- SEOs are soldiers first and scientists second.
- The SEO program is a separate career track within the Army Acquisition Corps that manages the officers from “cradle to grave.” (Cradle may be as a new officer recruit with D.Sci or M.S., or as a senior Captain going into doctoral program.)
- SEOs come from ROTC, USMA, and fully funded active duty programs. Improve quality by requiring more science and engineering doctorates.
- Warrior foundation crucial for all SEOs — greening of new officers with degrees immediately.
- Utilize SEOs in the labs to work on Army technological issues and in the

“field” with line commanders to facilitate the transition of technology into combat utility.

- Utilize the core in the Army of current Ph.D. holders to jump-start the program. Approximately 400 officers hold Ph.D.s as of May 2001; Over 25 percent of these degrees are technical and, therefore, eligible for designation as SEO members.
- Place these core SEOs into the most critical positions (Major Command Headquarters and Program Officers) as soon as possible.
- SEO program will better focus Army research efforts to provide better relevance to meet Army needs and short-falls.
- Priority placement of SEOs is to bring the technological knowledge to the Warfighter, not have research and technology languish in the labs.

IMPLEMENTING ACTIONS

The SEO program would not be very difficult to implement procedurally, especially since the implementation of OPMS XXI. The more difficult task will be changing the behavior of the officer corps — from the top down — to embrace this small group of specialized officers, treat this group with the requisite level of respect, and ensure the SEOs have the access necessary to perform their mission. The Army should convene a Task Force led by the Personnel Command with adequate representation from the Major

Commands and USMA to create the specific implementing instructions (regulations, policy, positions, and funding) for the SEO program. The following are some suggested actions the Army should take to successfully implement the program.

- Make necessary changes to DA Pamphlet 600-3 and AR 611-101 officer personnel management regulations.
- Create a viable career path within the AAC — code positions for Ph.Ds. (AMC's first cut was 202 positions with an inventory pool of 250 to cover schools and administrative time.)
- Establish career timelines similar to attachment 1) that reflect the three SEO accession sources (Direct Commission, ROTC and mid-career fully funded officers).
- Conduct a marketing campaign to recruit high quality officers into the SEO program.
- Work with universities and colleges to link the doctoral research time with Army labs or program manager organizations to obtain familiarization with Army issues and problems.
- Rotate AMC "field" and USMA instructors to get synergy and cross-fertilization of ideas and experiences in various technological areas.
- Implement specialty pay or retention bonus program (wait and watch).
- Allow periodic training periods for technical currency.
- Use promotion floors to maintain career track pyramid.
- Create SEO positions to get the expertise sprinkled throughout the Army (3- and 4-star command level technology manager (advisor), United States Military Academy/Permanent Assistant Professor (USMA/PAP), Center for Army Analysis, battle labs, Louisiana Maneuver Task Force, Force Development/Concept development organizations in each TRADOC school and at Office of the Deputy Chief of Staff for Operations (ODSCSOPS), lab researchers, science advisors, Program/project office technical staff, Defense Advanced Research Projects Agency (DARPA), and testing agencies/ranges).
- Use positions to manage the inventory to meet future demand.
- Obtain broad institutional support in the Army to ensure changes in the Army's negative perception of a specialized core.
- Accept alternate means (correspondence courses, post-doctoral work, etc.) for SEOs to receive credit for Military Education Level (MEL) schools after their basic branch advance courses if the officer's timeline for critical jobs does not allow in-residence MEL education. Keep scientists working more on science and problem solving.

This listing is a first cut at the necessary actions the Army needs to take. The personnel managers and policy experts on the Task Force will flush out the particulars.

It is a lot easier to make a list than to execute the actions. The entire process will take time and considerable effort. The Army could leverage a lot of the work AMC did as part of the OPMS XXI Task Force to shorten the implementation timeline.

CONCLUSION

We are an “Army of One” now. We seek individuals that bring a myriad of talents, strengths, and commitment. If the Army is to succeed in retaining the new breed of soldier and officer, it must throw away the old paradigms for leader progression. The Army needs uniformed scientists and engineers at the doctorate level. “...they are an indispensable underpinning of national strength and prosperity — sustaining the creativity and intellectual vigor needed to address a growing range of

social and economic concerns” (U.S. House of Representatives, 1995, p. 143).

The Army must develop a personnel management system and leader philosophy that will embrace the unique talents and utilize these talented officers to maximize their contribution to the Army and their job satisfaction. SEOs will make a difference. They will bring the Army through this period of transformation better serviced by on-going and future technological breakthroughs. As the Army transforms its organizations and weapons, it must transform its people and the system to manage its most critical asset. Put the rhetoric aside; embrace the value, intelligence, and commitment these scientific warriors bring to the Army and create a program that maximizes their contribution and allows them and the Army to prosper — start the Scientist and Engineer Officer program now.



Lieutenant Colonel Camille Nichols, USA, served as product manager, Second Generation Forward Looking Infra-Red (FLIR), Fort Belvoir, VA. She holds a B.S. degree from the U.S. Military Academy, an M.S. from the University of Southern California, another M.S. from the Industrial College of the Armed Forces, an M.A. from the U.S. Naval War College, and a DSci from George Washington University. She is currently serving as the executive officer to the Military Deputy to the Assistant Secretary of the Army for Acquisition Logistics and Technology at the Pentagon.

(E-mail address: nicholsc@saalt.army.mil)

REFERENCES

- Christle, G. E., DiTrapani, A. R., Marmaud, K. D., Sullivan, M. P., Thomas, J. A., Miller, M. A., Ferara, J. A., & Johnson, R. V. (2001). *The Army acquisition management study: Congressional mandate for change*. Alexandria, VA: Center for Naval Analysis.
- Hay, R. G. (1989, July/August). The uniformed scientist — An uncertain future. *Army Research, Development & Acquisition Bulletin*, 17–19.
- Jette, B., & Brand, J. H. (1994). Wizard or warrior? How to use scientists in uniform — or not. Unpublished paper.
- Johnson, J. (1996). The ad hoc study final report: The science and engineering requirements for military officers and civilian personnel in the high tech Army of today and tomorrow. Washington, DC: Army Science Board.
- McCaffrey, B. R. (2002, March). 'Duty, honor, country,' U.S. Military Academy's enduring relevance. *Armed Forces Journal International*, 6–12.
- Schofield, P. (2000, June 29). Education: It's all about advancing the frontiers. *The Independent*. Retrieved from www.independent.co.uk/story.jsp?story=4432
- Story, T. (2002, January). *Read ahead uniformed Army scientist program* (Briefing packet). Alexandria, VA: U.S. Army Materiel Command.
- Thurgood, L. N. (2002, January). To provide the Director, OPMD with information regarding uniformed Army scientists (Briefing). Alexandria, VA: U.S. Army Total Personnel Command.
- U.S. Army Laboratory Command. (1990, February 5). Uniformed Army scientists (Briefing). Adelphi, MD: Author.
- U.S. Army Materiel Command. (1991, March 7). Uniformed Army scientists (Briefing). Alexandria, VA: Author.
- U.S. House of Representatives. (1995, July 13). *Reshaping the graduate education of scientists and engineers: NAS's committee on science engineering, and public policy report*. House of Representatives Hearing, Subcommittee on Basic Research of the Committee on Science; 104th Congress. Washington, DC: Government Printing Office.

